



WHITE AND YELLOW ACRYLIC WATERBORNE TRAFFIC MARKING PAINT MSP-94-06J

1.0 Description. These specifications cover waterborne traffic paint for application on bituminous or Portland cement concrete pavements at application temperatures of 50 to 150 F (10 to 65 C). The paint shall be capable of receiving and holding glass beads for producing reflectorized traffic markings.

2.0 Materials. The paint shall not contain more than 3200 ppm lead and/or more than 800 ppm chromium, based on dry weight, and shall have limited Volatile Organic Content (VOC), as noted herein.

2.1 Acrylic Emulsion Polymer. The acrylic emulsion polymer used in the manufacture of the paint shall be Rohm & Haas E-2706, Dow DT211, or equal.

2.2 General. The finished paint shall be formulated and manufactured from firstgrade materials and shall be a fast drying, water based, acrylic resin type paint capable of withstanding air and roadway temperatures without bleeding, staining, discoloring, or deforming. The dried paint film shall be capable of maintaining its original dimensions and placement without chipping, spalling, or cracking. In addition, it shall not deteriorate because of contact with sodium chloride, calcium chloride, mild alkalies and acids, or other ice control materials, or oil, gasoline or diesel fuel drippings from vehicles.

2.3 Durability Testing. Determination of conformance to this specification will include, but will not be limited to, the evaluation of test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) or other MoDOT approved facilities. The maintained retroreflectivity and durability shall conform to the following requirements after being installed on at least one NTPEP test deck for at minimum of six (6) months. The six-month data must include the winter months of December, January, and February and the data shall be obtained from evaluation on an NTPEP test deck in a northern, wet climate region.

2.3.1 Maintained retroreflectivity. Photometric quantity to be measured is coefficient of retroreflective luminance (R_L) in accordance with the requirements of ASTM E1743 for 15-meter geometry and ASTM E1710 for 30-meter geometry. The average R_L for concrete and asphalt surfaces shall be expressed in millicandelas per square foot per foot-candle and shall be at least 100 for 15 meter geometry or 75 for 30 meter geometry, when measured in the wheel path area.

2.3.2 Durability. Paint shall have a durability rating of at least 4 for both concrete and asphalt surfaces when tested in the wheel path area of the NTPEP test deck.

2.4 Mixed Paint. The mixed paint shall conform to the following requirements.

2.4.1 The paint shall be strained before filling, using a screen or strainer not coarser than 40 mesh or equivalent.

2.4.2 The volatile content of the finished paint shall contain less than 150 grams of volatile organic matter per liter in accordance with ASTM D3960.

2.4.3 The paint shall have the following properties:

2.4.3.1 Physical Properties.

Weight per Gallon, 77°F (25°C), lbs.	Report
Viscosity, 77°F (25°C), Krebs Units	83-98
Grind (Hegman Gage), min.	3
Laboratory Dry Time, ASTM D 711, minutes, max.	10
Dry Through Time, minutes, max.	150

2.4.3.2 Color. For white, the color shall closely match Color Chip 37925 of Federal Standard 595b and for yellow, the color shall closely match Color Chip 33538 of Federal Standard 595b. Color determination will be made for markings and the diffuse daytime color of the markings shall conform to the below CIE Chromaticity coordinate limits. Color determination for liquid marking materials will be made over the black portion of a 2A or 5C Leneta Chart (or equal) at least twenty-four (24) hours after application of a 15mil wet film. Color readings will be determined in accordance with the requirements of ASTM E1349 using CIE 1931 2 standard observer and CIE standard illuminant D65.

CIE CHROMATICITY COORDINATE LIMITS (INITIAL)								
Color	1		2		3		4	
	x	y	x	y	x	y	x	y
White	0.334	0.357	0.334	0.317	0.297	0.357	0.297	0.317
Yellow	0.531	0.483	0.531	0.429	0.471	0.483	0.471	0.429

2.4.3.3 Flexibility. The paint shall show no cracking or flaking when tested in accordance with Federal Specification TT-P-1952B.

2.4.3.4 Water Resistance. The paint shall conform to Federal Specification TT-P-1952B. There shall be no blistering or appreciable loss of adhesion, softening, or other deterioration after examination.

2.4.3.5 Freeze-Thaw Stability. The paint shall show no coagulation or change in consistency greater than 10 Krebs Units, when tested in accordance with Federal Specification TT-P-1952B.

2.4.3.6 Heat Stability. The paint shall show no coagulation, discoloration or change in consistency greater than 10 Krebs Units, when tested in accordance with Federal Specification TT-P-1952B.

2.4.3.7 Dilution Test. The paint shall be capable of dilution with water at all levels without curdling or precipitation such that the wet paint can be readily cleaned up with water only.

2.4.3.8 Storage Stability. After 30 days storage in three-quarters filled, closed container, the paint shall show no caking that cannot be readily remixed to a smooth, homogeneous state, no skinning, livering, curdling, or hard settling. The viscosity shall not change more than 5 Krebs Units from the viscosity of the original sample.

2.4.3.9 Contrast Ratio. The minimum contrast ratio (hiding power) shall be 0.96 when drawn down with a 0.005 mil film applicator on a 2A or 5C Leneta Chart (or equal) and dried for 24 hours. Contrast Ratio = Black/White.

2.4.3.10 Reflectance. The daylight directional reflectance of a 15 mil wet film applied to a 2A or 5C Leneta Chart (or equal) and dried for a minimum of 24 hours shall not be less than 84 percent for the white paint and not less than 50 percent for the yellow paint.

2.3.3.11 Bleeding. The paint shall have a minimum bleeding ratio of 0.97 when tested in accordance with Federal Specification TT-P-1952B. The asphalt saturated felt shall conform to ASTM D 226 for Type I.

2.3.3.12 No-Tracking Time Field Test. The paint shall dry to a no-tracking condition under traffic in three minutes maximum when applied at 15 ± 1 mil wet film thickness at $130 \pm 10^\circ\text{F}$ ($54\text{--}66^\circ\text{C}$), and from three to ten minutes when applied at ambient temperatures, with 6 pounds (2.72 kilograms) of glass beads per gallon (3.8 liters) of paint. "No tracking" shall be the time in minutes required for the line to withstand the running of a standard automobile over the line at a speed of approximately 40 mph (64 kph) simulating a passing procedure without tracking of the reflectorized line when viewed from a distance of 50 feet (15 meters).

2.3.3.13 Dry Through Time. The paint shall be applied to a non-absorbent substrate at a wet film thickness of 15 ± 1 mils and placed in a humidity chamber controlled at 90 ± 5 percent R.H. and $72.5 \pm 2.5^\circ\text{F}$. The dry through time shall be determined according to ASTM D 1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

2.4 Glass Beads. Unless otherwise specified, Type I moisture resistant beads shall be used at the minimum rate of 8 pounds per gallon of paint.

3.0 Acceptance.

3.1 Except as noted herein, each batch or lot of paint shall be sampled and approved prior to use.

3.2 No paint shall be used that is more than 15 months old.

3.3 Paint furnished by a paint manufacturer who has been listed by the MoDOT Materials Manual as being currently tested and has otherwise complied with all requirements of this specification for a General Services Bid request may be accepted on the basis of a manufacturer's certification stating that the material is the same as that furnished for Bid Request _____. The certification shall include the lot number of the paint being furnished.

3.4 The paint manufacturer shall supply certification that the paint supplied meets the requirements of this specification. The certification shall include reference to the specific NTPEP test deck to which the paint was applied, including NTPEP identification numbers and report numbers.